

Amendment and Response

Applicant: Clyde M. Guest et al.

Serial No.: 09/848,479

Filed: May 3, 2001

Docket No.: A126.164.102 (Previously: B63814C-013377-0084)

Title: SYSTEM AND METHOD FOR SELECTION OF A REFERENCE DIE

REMARKS

The following remarks are made in response to the Non-Final Office Action mailed February 5, 2005. In that Office Action, the Examiner rejected claims 73-75, 79-81, and 90-92 under 35 U.S.C. §103(a) as being unpatentable over the combination of Sumie et al., U.S. Patent No. 6,943,437 ("Sumie") and Gallarda et al., U.S. Patent No. 6,539,106 ("Gallarda"). Claims 90-92 and 98 were rejected under 35 U.S.C. §103(a) as being unpatentable over the combination of Sumie and Gallarda, and further in combination with Schemmel et al., U.S. Patent No. 5,943,551 ("Schemmel"). Claims 76, 82, 83, 86, 97, and 93 were rejected under 35 U.S.C. §103(a) as being unpatentable over the combination of Sumie and Gallarda, and further in combination with Miyazaki, U.S. Patent No. 6,031,607 ("Miyazaki"). Claim 98 was rejected under 35 U.S.C. §103(a) as being unpatentable over Sumie and Gallarda, and further in combination with Khalaj et al., U.S. Patent No. 6,613,275 ("Khalaj"). Claims 78, 96, and 97 were rejected under 35 U.S.C. §103(a) as being unpatentable over Sumie and Gallarda, and further in combination with Berezin et al., U.S. Patent No. 5,539,752 ("Berezin"). Claims 76, 82-89, and 93 were rejected under 35 U.S.C. §103(a) as being unpatentable over Sumie and Gallarda, and further in combination with Brecher et al., U.S. Patent No. 5,544,256 ("Brecher"). Claims 77, 94, and 95 were rejected under 35 U.S.C. §103(a) as being unpatentable over the combination of Sumie and Gallarda, and further in combination with Michael, U.S. Patent No. 5,640,200 ("Michael"). Claims 94 and 95 were rejected under 35 U.S.C. §103(a) as being unpatentable over the combination of Sumie, Gallarda, and Schemmel as applied to claim 90 above, and further in combination with Michael.

With this Response, independent claims 73, 79 and 90 have been amended. Claims 73-98 remain pending in the application and are presented for reconsideration and allowance.

35 U.S.C. §103 Rejections

Claims 73-75, 79-81, and 90-92 were rejected under 35 U.S.C. §103(a) as being unpatentable over the combination of Sumie and Gallarda. Amended independent claim 73 relates, in part, to a system for selection of a reference die image comprising: a die image comparator operable to create a difference image without a previously selected reference image,

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wherein the difference image is based upon a first die image and a second die image; and a difference image analysis system coupled to the die image comparator, operable to determine whether the first die image and the second die image may be used as the reference die image. For at least the reasons described below, the cited references fail to teach or suggest limitations of claim 73 as amended.

At page 4 of the Office Action, the Examiner cites Sumie as teaching the concept of a defect free reference image for subsequent comparison with an inspection image, where “the reference image data ID_c to be stored in the image memory 3c of the image processor 3 ... may be data of an image obtained by picking up an image of a portion of the surface of the semiconductor wafer where there is no defect” (citing Sumie, column 7, line 55). The Examiner acknowledges that while Sumie states that an “image of the semiconductor wafer 1 in a position where no defect exists is further picked up to use as a reference image” (citing Sumie, col. 9, line 1), Sumie does not describe how the “image of a portion of the surface of the semiconductor wafer where there is no defect” is determined in the first place. The Examiner attempts to remedy the acknowledged deficiency of Sumie “by incorporating the ‘arbitration’ method of Gallarda to initially determine a defect free image to use as the reference.” The Examiner states that “the teaching of Gallarda provides a way to fulfill Sumie’s requirement for a defect free reference image picked up from a portion of the surface of the semiconductor wafer where there is no defect.”

However, the combination of Sumie and Gallarda does not teach or suggest creating a difference image without a previously selected reference image, as required by the limitations of amended claim 73. At column 4, lines 58-59 of Sumie, it is taught that “the reference image data is stored in advance in the image memory 3c” (emphasis added). At column 7, lines 50-57 of Sumie, it is taught that “the reference image data ID_c to be stored in the image memory 3c of the image processor 3 may be generated by applying image processing, ... based on design data... , or... data obtained by picking up an image of a portion of the surface... where there is no defect.” The Examiner’s use of Gallarda simply shows one method by which the reference image of Sumie may be generated prior to being stored in the image memory 3c.

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All embodiments Sumie require both an inspection image I_b and a pre-stored reference image I_c (Sumie, for example, Figs. 8, 13, 16, 17, & 18). In fact, failure to provide a “prestored reference image I_c ” (Sumie, column 7, lines 63-67) would defeat the functionality of the method of Sumie, because luminance information LI_1 , LI_2 would no longer be capable of initial calculation. Thus, Sumie actually teaches away from a comparator operable to create a difference image without a previously selected reference image, wherein the difference image is based upon a first die image and a second die image, as required by the limitations of amended claim 73. In light of the above, it is believed that amended independent claim 73 is patentable over the combination of references cited against it.

Independent claims 79 and 90, as amended, are similarly distinguishable over the cited references. In particular, both claims 79 and 90 as amended relate, in part, to identification of a reference image without a previously selected reference image. Therefore, claims 79 and 90 are believed to present patentably distinct material over the cited references for reasons similar to those described above in association with amended independent claim 73.

Independent claim 90 was also rejected under 35 U.S.C. §103(a) as being unpatentable over the combination of Sumie and Gallarda, as described above, and further in combination with Schemmel. The Sumie and Gallarda combination is alleged to select a defect free die as a reference die based on the comparison of at least first and second die images, but Sumie is acknowledged as failing to teach storing and then combining the acceptable first and second die images to form the reference die image.

As noted above with respect to claim 73, the Sumie-Gallarda combination fails to make obvious creating a difference image without a previously selected reference image. Schemmel fails to remedy this deficiency, as Schemmel requires a “reference chip 40 positioned in a specific place within the overall pattern of silicon chips 38” (Schemmel, column 5, lines 17-18). That is, the reference chip is previously selected. Accordingly, the combination of Sumie, Gallarda and Schemmel fails to make obvious the subject matter of amended independent claim 90.

The Examiner rejected dependent claims 76-78, 82-89, and 93-98 under 35 U.S.C. §103(a) as being unpatentable over Sumie, Gallarda, and one or more of: Schemmel, Miyazaki,

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Khalaj, Berezin, Brecher, and Michael. As described above, the combination of Sumie and Gallarda does not teach or suggest the limitations of amended independent claims 73, 79, or 90. Indeed, Sumie must utilize a previously selected reference image to avoid changing Sumie's principle of operation or defeat the functionality of "the inventive method" Sumie. MPEP §2145(X)(D). In other words, Sumie taken as a whole teaches away from such limitations as it would require abandonment of calculating luminance information LI_1, LI_2 as taught in Sumie's inventive method.

Even if Sumie didn't teach away from such limitations, none of the additionally cited references teach or suggests the limitations of claims 73, 79 or 90 as amended. As claims 77-78, 82-90 and 91-98 depend from those claims, they are also neither taught nor suggested by the cited references.

For example, Schemmel relies on a "reference chip 40 positioned in a specific place within the overall pattern of silicon chips 38" (Schemmel, column 5, lines 17-18).

Michael, relates to a difference image resulting from comparison of a test image and a golden template image (an ideal reference image). (Michael, column 3, lines 34-36.)

Miyazaki relates to obtaining a difference image from a difference between a detection image and reference images. (Miyazaki, column 3, lines 20-30.)

Khalaj relates to automated direct patterned wafer inspection wherein a technique utilizing a defect-free reference image for making comparison with an actual image acquires all its needed information from a single image. (Khalaj, abstract.)

Berezin does not relate to a difference image, but relates to storing a database of defects to facilitate classification. (Berezin, column 5, lines 46-66.)

Brecher only relates to a difference image based on an original image minus a golden template. (Office Action dated 4/26/04, page 13 and Brecher, column 13, lines 25-30.)

In light of the teachings of the cited references, independent claims 73, 79 and 90 as amended, as well as claims 74-78, 80-89 and 91-98 depending therefrom, are believed to present patentably distinct material from the cited references. As such, withdrawal of the Examiner's rejection of claims 73-98 is respectfully requested with allowance, and notification to that effect.

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CONCLUSION

In view of the above, Applicant respectfully submits that pending claims 73-98 are in form for allowance and are not taught or suggested by the cited references. Therefore, reconsideration and withdrawal of the rejections and allowance of claims 73-98 is respectfully requested.

No fees are required under 37 C.F.R. 1.16(b)(c). However, if such fees are required, the Patent Office is hereby authorized to charge Deposit Account No. 50-0471.

The Examiner is invited to contact the Applicant's representative at the below-listed telephone numbers to facilitate prosecution of this application.

Respectfully submitted,

Clyde M. Guest et al.,

By their attorneys,

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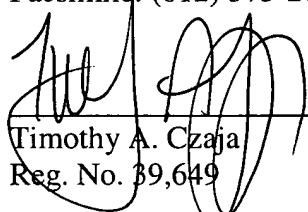
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CERTIFICATE UNDER 37 C.F.R. 1.8:

The undersigned hereby certifies that this paper or papers, as described herein, are being deposited in the United States Postal Service, as first class mail, in an envelope addressed to: Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on this 3rd day of May, 2005.

By 

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